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Evaluating Herbicide Injury on Soybean

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Abstract
The potential for herbicide injury with preemergence herbicides is greater with soybean than corn. The risk increases with environmental conditions that reduce crop vigor and growth rate, and also with heavy rain that moves the herbicide to the depth of the germinating seed or emerging seedling. Much of the state has experienced these conditions, thus it is likely symptoms will be found in many fields as people return to the field with the improved weather.

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Sulfentrazone (Authority mixes) and flumioxazin (Valor) are Herbicide Group (HG) 14 (PPO inhibitors) products with a relatively high risk of injury. Injury is most likely when rain increases herbicide availability as the hypocotyl approaches or emerges through the soil surface. Symptoms include necrotic lesions on the cotyledons and hypocotyl, and often are more severe in poorly drained areas of the field (Figure 1). In worse case scenarios, the hypocotyl can be girdled, resulting in plant death (Figure 2). The herbicide may contact the apical bud, this results in malformed leaves and occasionally death of the primary stem. Since HG 14 herbicides are contact materials, soybean usually recover quickly from the injury, except in cases where the hypocotyl is girdled or apical bud is damaged. The low use rate of saflufenacil (Sharpen) in soybean reduces, but doesn't eliminate, the risk of injury with this product.

Figure 1. Necrotic lesions on cotyledons due to HG 14.

Figure 2. Girdled stem associated with heavy rain at emergence and HG 14.

HG 15 (amide-type) are less likely to cause soybean injury than HG 14 products. The most common symptom is development of heart-shaped leaflets (Figure 3). Soybean typically grow out of this very quickly. An interaction between HG 15 products and flumioxazin reduces soybean tolerance, therefore increasing the potential for adverse crop response (Figure 4). Fields treated with tank mixes of these products or Fierce (flumioxazin + pyroxasulfone) prior to the heavy rains may exhibit symptoms.

Figure 3. Malformed leaves occasionally caused by HG 15.

Figure 4. Damage to growing point from combination of flumioxazin, pyroxasulfone, and heavy rain at emergence.

Metribuzin (HG 5) causes interveinal chlorosis and necrosis on emerged leaves (Figure 5). Symptoms typically appear on unifoliates and the first trifoliate leaves, later-emerging leaves are usually unaffected. In worst-case scenarios, two or three nodes of leaves may be killed. The risk increases in fields with high pH soils due to greater availability of the herbicide.

Figure 5. Interveinal chlorosis/necrosis caused by metribuzin. *Image provided by Aaron Hager, U of Ill.*

Pendimethalin and trifluralin (HG 3) cause swelling of the hypocotyl, reduced root growth, and delayed emergence (Figure 6). Injury is most likely where cool, wet soils slow emergence, therefore increasing absorption of the herbicide into the emerging soybean.

Figure 6. Swollen hypocotyls associated with HG 3 products and cool, wet weather. *Image provided by Aaron Hager, U of Ill.*

Crop injury is a risk associated with using herbicides, the lower herbicide tolerance of soybean than corn increases the likelihood of damage. Most preemergence products used in soybean are either contact or xylem mobile herbicides, thus little herbicide reaches the growing point under most situations. This increases the likelihood that injured crops will quickly recover from the damage, minimizing the risk of yield loss. Where injury is evident, stand counts should be taken to determine if stand loss has occurred, fields should be closely monitored over the next few weeks to document recovery, and finally, any field operations that could place additional stress on the crop should be avoided until normal growth resumes.

I appreciate Aaron Hager at University of Illinois providing the images of HG 3 and 5 injury. While I lived through the era when those products were widely used and injury was common, I failed to convert my 35 mm slides to digital format, thus I didn't have the images until Aaron stepped up.

Category: Weeds

Crop:

Soybean

Tags: herbicide injury crop response

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Dr. Bob Hartzler is a professor of agronomy and an extension weed specialist. He conducts research on weed biology and how it impacts the efficacy of weed management programs in corn and soybean. Dr. Hartzler also teaches undergraduate classes in weed science and weed identificatio...